

# Social Housing of Laboratory Animals

## Selected Citations – updated August 2018

*Compiled by USDA, NAL, Animal Welfare Information Center (AWIC)*

*For the 5th Symposium on Social Housing of Laboratory Animals, Beltsville, MD*

*June 4 – 5, 2018*

This reference list is provided as a starting point from which to find relevant information on social housing of various animal species housed in laboratories. It is by no means a complete list. Contact the AWIC staff if you would like a more detailed search performed.

E-mail: awic@ars.usda.gov

Phone: (301) 504-6212

Web site: <https://www.nal.usda.gov/awic>

## Table of Contents

Nonhuman Primates.....	1
Dogs .....	8
Fish and Amphibians.....	11
Pigs.....	13
Rabbits .....	18
Rodents.....	22
Ruminants.....	30

## Nonhuman Primates

### Association of Primate Veterinarians Socialization Guidelines for Nonhuman Primates in Biomedical Research.

Online:<http://www.primatevets.org/Content/files/Public/education/APV%20Social%20Housing%20Guidelines%20final.pdf>

Abney, D.M.; Moomaw, H.A. (2015). **Strategies for successfully social housing incompatible cynomolgus macaque trios.** *American journal of primatology* 77(Suppl. 1): 59-60.

Abney, D.M. and J.L. Weed (2006). **Methods for successfully pair housing adult male rhesus macaques (*Macaca mulatta*).** *American Journal of Primatology* 68(Suppl. 1): 59.  
Online: <https://dx.doi.org/10.1002/ajp.20270>

Alexander, S. and M. Fontenot (2003). **Isosexual social group formation for environmental enrichment in adult male *Macaca mulatta*.** *Contemporary Topics in Laboratory Animal Science* 42(4): 122.

Asvestas, C. and M. Reiniger (1999). **Forming a bachelor group of long-tailed macaques (*Macaca fascicularis*).** *Laboratory Primate Newsletter* 38(3): 14-15.  
Online: <http://www.brown.edu/Research/Primate/lpn38-3.html#group>

Augustsson, H. and J. Hau (1999). **A simple ethological monitoring system to assess social stress in group-housed laboratory rhesus macaques.** *Journal of Medical Primatology* 28 (2): 84-90.

Baker, K.C. (2016). **Survey of 2014 behavioral management programs for laboratory primates in the United States.** *American Journal of Primatology* 78(7): 780-796.  
Online: <https://dx.doi.org/10.1002/ajp.22543>

Baker, K.C., M.A. Bloomsmith, B. Oettinger, K. Neu, C. Griffis, and V.A. Schoof (2014). **Comparing options for pair housing rhesus macaques using behavioral welfare measures.** *American Journal of Primatology* 76(1): 30-42.  
Online: <https://dx.doi.org/10.1002/ajp.22190>

Baker, K.C., M. Bloomsmith, K. Neu, C. Griffis, B. Oettinger, V. Schoof, A. Clay, and M. Maloney (2008). **Benefits of isosexual pairing of rhesus macaques (*Macaca mulatta*) vary with sex and are limited by protected contact but not by frequent separation.** *American Journal of Primatology* 70(Suppl. 1): 44.  
Online: <https://dx.doi.org/10.1002/ajp.20556>

Baker, K.C., M.A. Bloomsmith, B. Oettinger, K. Neu, C. Griffis, V. Schoof, and M. Maloney (2012). **Benefits of pair housing are consistent across a diverse population of rhesus macaques.** *Applied Animal Behaviour Science* 137(3-4): 148-156.  
Online: <https://dx.doi.org/10.1016/j.applanim.2011.09.010>

Baker, K.C., C.M. Crockett, G.H. Lee, B.C. Oettinger, V. Schoof, and J.P. Thom (2012). **Pair housing for female longtailed and rhesus macaques in the laboratory: Behavior in protected contact versus full contact.** *Journal of Applied Animal Welfare Science* 15(2): 126-143.  
Online: <https://dx.doi.org/10.1080/10888705.2012.658330>

Ballestaa, S., G. Reymond, M. Pozzobon, and J. Duhamel (2014). **A real-time 3D video tracking system for monitoring primate groups.** *Journal of Neuroscience Methods* 234(Sp. Iss. SI): 147-152.  
Online: <https://dx.doi.org/10.1016/j.jneumeth.2014.05.022>

Bayne, K. (2014). **A historical perspective on social housing.** *The Enrichment Record* 18: 8-11.  
Online: <http://enrichmentrecord.com/wp-content/uploads/2014/01/HISTORICAL-PERSPECTIVE.pdf>

Bennett, B. T. (2016). **Association of Primate Veterinarians 2014 Nonhuman Primate Housing Survey.** *Journal of the American Association for Laboratory Animal Science: JAALAS* 55(2): 172-174.  
Online: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4783636/>

Bernstein, I.S. (1991). **Social housing of monkeys and apes: group formations.** *Laboratory Animal Science* 41(4): 329-333.

Bergman, Thore J. and M.J. Sheehan (2013). **Social knowledge and signals in primates.** *American Journal of Primatology* 75(7): 683-694.  
Online: <https://dx.doi.org/10.1002/ajp.22103>

Bliss-Moreau, E., G. Moadab, M.D. Bauman, and D.G. Amaral (2013). **The impact of early amygdala damage on juvenile rhesus macaque social behavior.** *Journal of Cognitive Neuroscience* 25(12): 2124.  
Online: [https://dx.doi.org/10.1162/jocn\\_a\\_00483](https://dx.doi.org/10.1162/jocn_a_00483)

Bloomsmith, M., K. Baker, C. Griffis, B. Oettinger, V. Schoof, A. Clay, and M. Maloney (2008). **Behavioral benefits of pair housing in adult rhesus macaques (*Macaca mulatta*) do not depend on age, previous duration of single housing, or naturalistic rearing.** *American Journal of Primatology* 70(Suppl. 1): 44.  
Online: <https://dx.doi.org/10.1002/ajp.20556>

Bray, J., C. Krupenye, and B. Hare (2013). **Ring-tailed lemurs (*Lemur catta*) exploit information about what others can see but not what they can hear.** *Animal Cognition* Epub.  
Online: <https://dx.doi.org/10.1007/s10071-013-0705-0>

Camus, S.M.J., C. Rochais, C. Blois-Heulin, Q. Li, M. Hausberger, and E. Bezard (2014). **Depressive-like behavioral profiles in captive-bred single- and socially-housed rhesus and cynomolgus macaques: A species comparison.** *Frontiers in Behavioral Neuroscience* 8(FEB): Article Number 47.  
Online: <https://dx.doi.org/10.3389/fnbeh.2014.00047>

Capitanio, J.P., S.A. Blozis, J. Snarr, A. Steward, and B.J. McCowan (2017). **Do “birds of a feather flock together” or do “opposites attract”? Behavioral responses and temperament predict success in pairings of rhesus monkeys in a laboratory setting.** *American Journal of Primatology* 79(1): e22464.

Online: <https://dx.doi.org/10.1002/ajp.22464>

Cassidy, L.; Semple, S.; Hannibal, D.; McCowan, B.(2015). **Behavioural and Physiological Effects of Housing Type on Laboratory Housed Female Rhesus Macaques (*Macaca mulatta*)**. *Folia primatologica* 86(4): 259-260.

Chelluri, G.I., S.R. Ross, and K.E. Wagner (2013). **Behavioral correlates and welfare implications of informal interactions between caretakers and zoo-housed chimpanzees and gorillas**. *Applied Animal Behaviour Science* 147(3-4): 306-315.

Online: <https://dx.doi.org/10.1016/j.applanim.2012.06.008>

Crast, J.; Bloomsmith, M.A.; Jonesteller, T. (2015). **Effects of changing housing conditions on mangabey behavior (*Cercocebus atys*): Spatial density, housing quality, and novelty effects**. *American journal of primatology* 77(9): 1001-1014.

Online: <https://dx.doi.org/10.1002/ajp.22430>

DiVincenti Jr, L. and J.D. Wyatt (2011). **Pair housing of macaques in research facilities: A science-based review of benefits and risks**. *Journal of the American Association for Laboratory Animal Science* 50(6): 856-863.

Online: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3228921/>

DiVincenti, L., A. Rehrig, and J. Wyatt (2012). **Interspecies pair housing of macaques in a research facility**. *Laboratory Animals*: 1-3.

Online: <https://dx.doi.org/10.1258/la.2011.011134>

Doyle, L.A., K.C. Baker, and L.D. Cox (2008). **Physiological and behavioral effects of social introduction on adult male rhesus macaques**. *American Journal of Primatology* 70(6): 542-550.

Online: <https://dx.doi.org/10.1002/ajp.20526>

Gilbert, M.H. and K.C. Baker (2011). **Social buffering in adult male rhesus macaques (*Macaca mulatta*): Effects of stressful events in single vs. pair housing**. *Journal of Medical Primatology* 40(2): 71-78.

Online: <https://dx.doi.org/10.1111/j.1600-0684.2010.00447.x>

Gazes, R.P., E.K. Brown, B.M. Basile, and R.R. Hampton (2013). **Automated cognitive testing of monkeys in social groups yields results comparable to individual laboratory-based testing**. *Animal Cognition* 16(3): 445-458.

Online: <https://dx.doi.org/10.1007/s10071-012-0585-8>

Gottlieb, D.H.; Maier, A.; Coleman, K. (2015). **Evaluation of environmental and intrinsic factors that contribute to stereotypic behavior in captive rhesus macaques (*Macaca mulatta*)**. *Applied animal behaviour science* 171: 184-191.

Online: <https://dx.doi.org/10.1016/j.applanim.2015.08.005>

Gulledge, J.P.; Fernandez-Carriba, S.; Rumbaugh, D.M.; Washburn, D.A (2015). **Judgments of Monkey's (*Macaca mulatta*) Facial Expressions by Humans: Does Housing Condition "Affect" Countenance?** *Psychological record* 65(1): 203-207.  
Online: <https://dx.doi.org/10.1007/s40732-014-0069-0>

Hannibal, D.L., E. Bliss-Moreau, J. Vandeleest, B. McCowan, and J. Capitanio (2017). **Laboratory rhesus macaque social housing and social changes: Implications for research.** *Journal of pharmacological and toxicological methods* 79(1): e22528.  
Online: <https://dx.doi.org/10.1002/ajp.22528>

Hartner, M., J. Hall, J. Penderghast, and L.P. Clark (2001). **Group housing subadult male cynomolgus macaques in a pharmaceutical environment.** *Lab Animal* 30(8): 53-57

Hoff, M., Powell, D., Lukas, K., & Maple, T. (1997). **Individual and social behavior of lowland gorillas in outdoor exhibits compared with indoor holding areas.** *Applied Animal Behaviour Science*, 54(4), 359–370.

Hotchkiss, C.E. and M.G. Paule (2003). **Effect of pair-housing on operant behavior task performance by rhesus monkeys.** *Contemporary Topics in Laboratory Animal Science* 42(4): 38-41.

Jorgensen, M.J., K.R. Lambert, S.D. Breaux, K.C. Baker, B.M. Snively, and J.L. Weed (2017). **Pair housing of Vervets/African Green Monkeys for biomedical research.** *Journal of pharmacological and toxicological methods* 79(1): e22501.  
Online: <https://dx.doi.org/10.1002/ajp.22501>

Kaiser, R.A., S.D. Tichenor, D.E. Regalia, K. York, and H.H. Holzgrefe (2015). **Telemetric assessment of social and single housing: Evaluation of electrocardiographic intervals in jacketed cynomolgus monkeys.** *Journal of pharmacological and toxicological methods* 75: 38-43.  
Online: <https://dx.doi.org/10.1016/j.vascn.2015.05.001>

Kaumanns Werner, Singh Mewa, and M. Schwibbe (2013). **Environmental change and housing conditions result in disappearance and return of reproductive seasonality in rhesus macaques (*Macaca mulatta*).** *Current Science* 105(4): 517-521.

Lee, G.H., J.P. Thom, K.L. Chu, and C.M. Crockett (2012). **Comparing the relative benefits of grooming-contact and full-contact pairing for laboratory-housed adult female *Macaca fascicularis*.** *Applied Animal Behaviour Science* 137(3-4): 157-165.  
Online: <https://dx.doi.org/10.1016/j.applanim.2011.08.013>

Leonardi, R., Buchanan-Smith, H. M., Dufour, V., MacDonald, C., & Whiten, A. (2010). **Living together: behavior and welfare in single and mixed species groups of capuchin (*Cebus apella*) and squirrel monkeys (*Saimiri sciureus*).** *American Journal of Primatology: Official Journal of the American Society of Primatologists*, 72(1), 33–47.

- Lopak, V. and R. Eikelboom (2000). **Pair housing induced feeding suppression: Individual housing not novelty.** *Physiology and Behavior*; 2000; 71 (3-4); 329-333.  
Online: [https://dx.doi.org/10.1016/S0031-9384\(00\)00347-4](https://dx.doi.org/10.1016/S0031-9384(00)00347-4)
- Majolo, B., Buchanan-Smith, H.M., and K. Morris (2003). **Factors affecting the successful pairing of unfamiliar common marmoset (*Callithrix Jacchus*) females: Preliminary results.** *Animal Welfare* 12 (3): 327-337.
- McCowan, B., K. Anderson, A. Heagarty, and A. Cameron (2008). **Utility of social network analysis for primate behavioral management and well-being.** *Applied Animal Behaviour Science* 109(2): 396-405.  
Online: <https://dx.doi.org/10.1016/j.applanim.2007.02.009>
- McGrew, K. (2014). **The importance of data collection to social housing.** *The Enrichment Record* 19: 20-21.  
Online: <http://enrichmentrecord.com/wp-content/uploads/2014/04/ER-0414.pdf>
- Morgan, D., K.A. Grant, O.A. Prioleau, S.H. Nader, J.R. Kaplan, M.A. Nader (2000). **Predictors of social status in cynomolgus monkeys (*Macaca fascicularis*) after group formation.** *American journal of primatology* 52(3): 115-131.  
Online: [https://dx.doi.org/10.1002/1098-2345\(200011\)52:3<115::AID-AJP1>3.0.CO;2-Z](https://dx.doi.org/10.1002/1098-2345(200011)52:3<115::AID-AJP1>3.0.CO;2-Z)
- Pearson, BL; Reeder, DM; Judge, PG (2015). **Crowding Increases Salivary Cortisol But Not Self-Directed Behavior in Captive Baboons.** *American journal of primatology* 77(4): 462-467.  
Online: <https://dx.doi.org/10.1002/ajp.22363>
- Pomerantz, O. and K.C. Baker (2017). **Higher levels of submissive behaviors at the onset of the pairing process of rhesus macaques (*Macaca mulatta*) are associated with lower risk of wounding following introduction.** *American journal of primatology* (Online version available).  
Online: <https://dx.doi.org/10.1002/ajp.22671>
- Price, E. E., & Stoinski, T. S. (2007). **Group size: Determinants in the wild and implications for the captive housing of wild mammals in zoos.** *Applied Animal Behaviour Science*, 103(3–4), 255–264.  
<https://doi.org/10.1016/j.applanim.2006.05.021>
- Reinhardt, V. (1999). **Pair-housing overcomes self-biting behavior in macaques.** *Laboratory Primate Newsletter* 38(1): 4-5.  
Online: <http://www.brown.edu/Research/Primate/lpn38-1.html#pair>
- Reinhardt, V. and A. Reinhardt (2000). **Social Enhancement for Adult Nonhuman Primates in Research Laboratories: A Review.** *Lab Animal* 29(1); 34-41.
- Roberts, S.J. and M.L. Platt (2005). **Effects of isosexual pair-housing on biomedical implants and study participation in male macaques.** *Contemporary Topics in Laboratory Animal Science* 44(5): 13-18.

Schapiro, S.J. and B.J. Bernacky (2011). **Socialization strategies and disease transmission in captive colonies of nonhuman primates.** *American Journal of Primatology* 74(6): 518-527.  
Online: <https://dx.doi.org/10.1002/ajp.21001>

Schapiro, S.J., M.A. Bloomsmith, L.M. Porter, and S.A. Suarez (1996). **Enrichment effects on rhesus monkeys successively housed singly, in pairs, and in groups.** *Applied Animal Behaviour Science* 48(3-4): 159-172. Online: [https://dx.doi.org/10.1016/0168-1591\(96\)01038-6](https://dx.doi.org/10.1016/0168-1591(96)01038-6)

Schapiro, S.J., M.A. Bloomsmith, S.A. Suarez, and L.M. Porter (1996). **Effects of social and inanimate enrichment on the behavior of yearling rhesus monkeys.** *American Journal of Primatology* 40(3): 247-260.  
Online: [https://dx.doi.org/10.1002/\(SICI\)1098-2345\(1996\)40:3<247::AID-AJP3>3.0.CO;2-Y](https://dx.doi.org/10.1002/(SICI)1098-2345(1996)40:3<247::AID-AJP3>3.0.CO;2-Y)

Schapiro, S.J., P.N. Nehete, J.E. Perlman, and K.J. Sastry (2000). **A comparison of cell-mediated immune responses in rhesus macaques housed singly, in pairs, or in groups.** *Applied Animal Behaviour Science* 68(1): 67-84.  
Online: [https://dx.doi.org/10.1016/S0168-1591\(00\)00090-3](https://dx.doi.org/10.1016/S0168-1591(00)00090-3)

Seelig, D. (2007). **A tail of two monkeys: Social housing for nonhuman primates in the research laboratory setting.** *Journal of Applied Animal Welfare Science* 10(1): 21-30.

Smith, A.S., A.K. Birnie, and J.A. French (2011). **Social isolation affects partner-directed social behavior and cortisol during pair formation in marmosets, *Callithrix geoffroyi*.** *Physiology & Behavior* 104(5): 955-961.  
Online: <https://dx.doi.org/10.1016/j.physbeh.2011.06.014>

Stoinski, T. S., Lukas, K. E., & Kuhar, C. W. (2013). Effects of age and group type on social behaviour of male western gorillas (*Gorilla gorilla gorilla*) in North American zoos. *Applied Animal Behaviour Science*, 147(3-4), 316–323. <https://doi.org/10.1016/j.applanim.2013.07.003>

Sullivan, J., K. Schultz, N. Goecks, M. Rosga, and C. Cruzen (2009). **Comparison of introduction strategies: gradual vs. protected contact in macaques.** *American Journal of Primatology* 71(Suppl. 1): 33.  
Online: <https://dx.doi.org/10.1002/ajp.20733>

Thompson, C.L. (2016). **To pair or not to pair: Sources of social variability with white-faced saki monkeys (*Pithecia pithecia*) as a case study.** *American Journal of Primatology* 78(5): 561-572.  
Online: <https://dx.doi.org/10.1002/ajp.22360>

Truelove, M.A., A.L. Martin, J.E. Perlman, J.S. Wood, and M.A. Bloomsmith (2017). **Pair housing of Macaques: A review of partner selection, introduction techniques, monitoring for compatibility, and methods for long-term maintenance of pairs.** *American Journal of Primatology* 79(1): e22485.  
Online: <https://dx.doi.org/10.1002/ajp.22485>

Watson, L. (2002). **A successful program for same-and cross-age pair-housing adult and subadult male *Macaca fascicularis*.** *Laboratory Primate Newsletter* 41(2): 6-9.  
Online: <http://www.brown.edu/Research/Primate/lpn41-2.html>

West, A., S. Leland, M. Collins, T. Welty, W. Wagner, and J. Erwin (2009). **Pair-formation in laboratory rhesus macaques (*Macaca mulatta*): a retrospective assessment in a compatibility testing procedure.** *American Journal of Primatology* 71(Suppl 1): 41.  
Online: <https://dx.doi.org/10.1002/ajp.20733>

Westergaard, G.C., M.K. Izard, J.H. Drake, S.J. Suomi, and J.D. Higley (1999). **Rhesus macaque (*Macaca mulatta*) group formation and housing: wounding and reproduction in a specific pathogen free (SPF) colony.** *American Journal of Primatology* 49(4): 339-347.

Stoinski, T. S., Lukas, K. E., & Kuhar, C. W. (2013). **Effects of age and group type on social behaviour of male western gorillas (*Gorilla gorilla gorilla*) in North American zoos.** *Applied Animal Behaviour Science*, 147(3–4), 316–323. <https://doi.org/10.1016/j.applanim.2013.07.003>

Williams, L.E., C.S. Coke, and J.L. Weed (2017). **Socialization of adult owl monkeys (*Aotus sp.*) in captivity.** *American Journal of Primatology* 79(1): e22521.  
Online: <https://dx.doi.org/10.1002/ajp.22521>

Wolfensohn, S. (2004). **Social housing of large primates: Methodology for refinement of husbandry and management.** *Alternatives to Laboratory Animals* 32(Suppl. 1A): 149-151.

Worlein, J.M., R. Kroeker, G.H. Lee, J.P. Thom, R.U. Bellanca, and C.M. Crockett (2017). **Socialization in pigtailed macaques (*Macaca nemestrina*).** *American Journal of Primatology* 79(1): e22556.  
Online: <https://dx.doi.org/10.1002/ajp.22556>

Xie, L., Q. Zhou, S. Liu, F. Xu, C.A. Shively, Q. Wu, W. Gong, Y. Ji, L. Fang, L. Li, N.D. Melgiri, and P. Xie (2014). **Effect of living conditions on biochemical and hematological parameters of the cynomolgus monkey.** *American Journal of Primatology* 76(100): 1011-1024.  
Online: <https://dx.doi.org/10.1002/ajp.22285>

Xing, G.; Lu, J.; Hu, M.; Wang, S.; Zhao, L.; Zheng, W.; Schofield, J.; Oldman, K.; Adkins, D.; Yu, H.; Platz, S.; Ren, J.; Skinner, M. (2015). **Effects of group housing on ECG assessment in conscious cynomolgus monkeys.** *Journal of pharmacological and toxicological methods* 75: 44-51.  
Online: <https://dx.doi.org/10.1016/j.vascn.2015.05.004>

## Dogs

Bayne, K. (2003). **Environmental enrichment of nonhuman primates, dogs and rabbits used in toxicology studies.** *Toxicologic Pathology Suppl* 31: 132-137.  
Online: <https://dx.doi.org/10.1080/01926230390175020>

Beerda, B., M.B.H. Schilder, J.A. van Hooff, H. W.de Vries, and J.A. Mol (2000). **Behavioural and hormonal indicators of enduring environmental stress in dogs.** *Animal Welfare* 9(1): 49-62.

Coban, Ö. (2013). **Housing conditions and dog welfare.** *Atatürk Üniversitesi Veteriner Bilimleri Dergisi* 8(2): 166-173.  
Online: <http://e-dergi.atauni.edu.tr/index.php/VBD/>

Dalla Villa, P., Barnard, S., Di Fede, E., Podaliri, M., Candeloro, L., Di Nardo, A., Serpell, J. A. (2013). **Behavioural and physiological responses of shelter dogs to long-term confinement.** *Veterinaria Italiana*, 49(2), 231–241.

Gfrerer, N., Taborsky, M., & Würbel, H. (2018). **Benefits of intraspecific social exposure in adult Swiss military dogs.** *Applied Animal Behaviour Science*, 201, 54–60.

Graham, L., D.L. Wells, and P.G. Hepper (2005). **The influence of visual stimulation on the behaviour of dogs housed in a rescue shelter.** *Animal Welfare* 14(2):143-148.

Grigg, E. K., Nibblett, B. M., Robinson, J. Q., & Smits, J. E. (2017). **Evaluating pair versus solitary housing in kennelled domestic dogs (*Canis familiaris*) using behaviour and hair cortisol: a pilot study.** *Veterinary Record Open*, 4(1), e000193. <https://doi.org/10.1136/vetreco-2016-000193>

Jongman, E. C., Butler, K. L., & Hemsworth, P. H. (2018). **The effects of kennel size and exercise on the behaviour and stress physiology of individually-housed greyhounds.** *Applied Animal Behaviour Science*, 199, 29–34.

Mariti, C., B. Carbone, E. Ricci, C. Sighieri, and A. Gazzano (2014). **Intraspecific attachment in adult domestic dogs (*Canis familiaris*): Preliminary results.** *Applied Animal Behaviour Science* 152: 64-72.  
Online: <https://dx.doi.org/10.1016/j.applanim.2013.12.002>

Mertens, P. A., & Unshelm, J. (1996). **Effects of group and individual housing on the behavior of kennelled dogs in animal shelters.** *Anthrozoös*, 9(1), 40–51.

Normando, S., B. Contiero, G. Marchesini, and R. Ricci (2014). **Effects of space allowance on the behaviour of long-term housed shelter dogs.** *Behavioural Processes* 103: 306-314.  
Online: <https://dx.doi.org/10.1016/j.beproc.2014.01.015>

Petak, I. (2013). **Communication patterns within a group of shelter dogs and implications for their welfare.** *Journal of Applied Animal Welfare Science* 16(2): 118-39.

Online: <https://dx.doi.org/10.1080/10888705.2013.741001>

Piccione, G., F. Arfuso, C. Giannetto, C. Faggio, and M. Panzera (2013). **Effect of housing conditions and owner's schedule on daily total locomotor activity in dogs (*Canis familiaris*)**. *Biological Rhythm Research* 44(5): 778-786.

Prescott, M. J., D. B. Morton, D. Anderson, A. Buckwell, S. Heath, and R. Hubrecht (2004). **Refining dog husbandry and care - Eighth report of the BVAWF/FRAME/RSPCA/UFAW Joint Working Group on Refinement**. *Laboratory Animals* (London) 38 (Suppl. 1): S1-S94  
Online: <http://www.nc3rs.org.uk/downloaddoc.asp?id=1365&page=51&skin=0>

Pullen, A. J., R. J. N. Merrill, and J.W. S. Bradshaw (2013). **The effect of familiarity on behavior of kennelled dogs during interactions with conspecifics**. *Journal of Applied Animal Welfare Science* 16(1): 64-76.  
Online: <https://dx.doi.org/10.1080/10888705.2013.741003>

Sadekova, N., G. Boudreau, B. Jalbert, and K. Norton (2016). **The effects of housing conditions on baseline cardiovascular parameters and the sensitivity to detect changes in contractility in telemetry-implanted dogs**. *Journal of Pharmacological and Toxicological Methods* 81: 60-74.  
Online: <https://dx.doi.org/10.1016/j.vascn.2016.05.001>

Scullion Hall, L.E.M., S. Robinson, J. Finch, and H.M. Buchanan-Smith (2017). **The influence of facility and home pen design on the welfare of the laboratory-housed dog**. *Journal of Pharmacological and Toxicological Methods* 83: 21-29.  
Online: <https://dx.doi.org/10.1016/j.vascn.2016.09.005>

Shiverdecker, M. D., P.A. Schiml, and M.B. Hennessy (2013). **Human interaction moderates plasma cortisol and behavioral responses of dogs to shelter housing**. *Physiology & Behavior* 109: 75-79.  
Online: <https://dx.doi.org/10.1016/j.physbeh.2012.12.002>

Wagner, D., S. Newbury, P. Kass, and K. Hurley (2014). **Elimination behavior of shelter dogs housed in double compartment kennels**. *Plos One* 9(5).  
Online: <https://dx.doi.org/10.1371/journal.pone.0096254>

Walker, J.K., C.J.C. Phillips, and N.K. Waran (2014). **The effect of conspecific removal on the behaviour and physiology of pair-housed shelter dogs**. *Applied Animal Behaviour Science* 158: 46-56.  
Online: <https://dx.doi.org/10.1016/j.applanim.2014.06.010>

Wells, D.L. (2004). **A review of environmental enrichment for kennelled dogs, *Canis familiaris***. *Applied Animal Behaviour Science* 85(3-4): 307-317.  
Online: <https://dx.doi.org/10.1016/j.applanim.2003.11.005>

Wells, D. L. (2004). **The influence of toys on the behaviour and welfare of kennelled dogs**. *Animal Welfare* 13(3): 367-373.

Yeon, S.C., G. Golden, W. Sung, H.N. Erb, A.J. Reynolds, and K.A. Houpt (2001). **A comparison of tethering and pen confinement of dogs.** *Journal of Applied Animal Welfare Science* 4(4): 257-270.  
Online: [https://dx.doi.org/10.1207/S15327604JAWS0404\\_03](https://dx.doi.org/10.1207/S15327604JAWS0404_03)

## Fish and Amphibians

- Cikanek, SJ; Nockold, S; Brown, JL; Carpenter, JW; Estrada, A; Guerrel, J; Hope, K; Ibanez, R; Putman, SB; Gratwicke, B (2014). **Evaluating Group Housing Strategies for the Ex-Situ Conservation of Harlequin Frogs (*Atelopus spp.*) Using Behavioral and Physiological Indicators.** *Plos one* | 2014. 9(2). Online: <https://dx.doi.org/10.1371/journal.pone.0090218>
- Collymore, C; Tolwani, RJ; Rasmussen, S (2015). **The Behavioral Effects of Single Housing and Environmental Enrichment on Adult Zebrafish (*Danio rerio*).** *Journal of the American Association for Laboratory Animal Science* 54(3): 280-285.
- Earley, R., Edwards, J., Aseem, O., Felton, K., Blumer, L., Karom, M., & Grober, M. (2006). **Social interactions tune aggression and stress responsiveness in a territorial cichlid fish (*Archocentrus nigrofasciatus*).** *Physiology & Behavior*, 88(4–5), 353–363. <https://doi.org/10.1016/j.physbeh.2006.04.002>
- Forsatkar, M. N., Safari, O., & Boiti, C. (2017). Effects of social isolation on growth, stress response, and immunity of zebrafish. *Acta Ethologica*, 20(3), 255–261.
- Hesse, S.; Anaya-Rojas, J.M.; Frommen, J.G.; Thünken, T. (2015). **Social deprivation affects cooperative predator inspection in a cichlid fish.** Royal society open science 2(3): 140451.
- Hesse, S.; Bakker, T.C.M.; Baldauf, S.A.; Thünken, T. (2016). **Impact of social environment on inter- and intrasexual selection in a cichlid fish with mutual mate choice.** *Animal behaviour* 111: 85-92. Online: <https://dx.doi.org/10.1016/j.anbehav.2015.10.004>
- Hesse, S; Thunken, T (2014). **Growth and social behavior in a cichlid fish are affected by social rearing environment and kinship.** *Naturwissenschaften* 101(4): 273-283. Online: <https://dx.doi.org/10.1007/s00114-014-1154-6>
- Johansen, R; Needham, JR; Colquhoun, DJ; Poppe, TT; Smith, AJ (2006). **Guidelines for health and welfare monitoring of fish used in research.** *Laboratory animals* 40(4): 323-340.
- Jolles, J.W.; Aaron Taylor, B.; Manica, A. (2016). **Recent social conditions affect boldness repeatability in individual sticklebacks.** *Animal behaviour* 112: 139-145. Online: <https://dx.doi.org/10.1016/j.anbehav.2015.12.010>
- Keck, V.A.; Edgerton, D.S.; Hajizadeh, S.; Swift, L.L.; Dupont, W.D.; Lawrence, C.; Boyd, K.L. (2015). **Effects of habitat complexity on pair-housed zebrafish.** *Journal of the american association for laboratory animal science* 54(4): 378-383.
- Kurtzman, MS; Craig, MP; Grizzle, BK; Hove, JR (2010). **Sexually segregated housing results in improved early larval survival in zebrafish.** *Lab animal* 39(6). 183-189.

Lidster, K., G.D. Readman, M.J. Prescott, and S.F. Owen (2017). **International survey on the use and welfare of zebrafish *Danio rerio* in research.** *Journal of Fish Biology* 90(5): 1891-1905.  
Online: <https://dx.doi.org/10.1111/jfb.13278>

Oldfield, RG (2011). **Aggression and Welfare in a Common Aquarium Fish, the Midas Cichlid.** *Journal of applied animal welfare science* 14(4): 340-360.  
Online: <https://dx.doi.org/10.1080/10888705.2011.600664>

Parker, M. O., Millington, M. E., Combe, F. J., & Brennan, C. H. (2012). **Housing Conditions Differentially Affect Physiological and Behavioural Stress Responses of Zebrafish, as well as the Response to Anxiolytics.** *PLoS ONE*, 7(4), e34992. <https://doi.org/10.1371/journal.pone.0034992>

Shams, S.; Chatterjee, D.; Gerlai, R. (2015). **Chronic social isolation affects thigmotaxis and whole-brain serotonin levels in adult zebrafish.** *Behavioural brain research* 292: 283-287.  
Online: <https://dx.doi.org/10.1016/j.bbr.2015.05.061>

van de Nieuwegenissen, P. G., Boerlage, A. S., Verreth, J. A. J., & Schrama, J. W. (2008). **Assessing the effects of a chronic stressor, stocking density, on welfare indicators of juvenile African catfish, Clarias gariepinus Burchell.** *Applied Animal Behaviour Science*, 115(3–4), 233–243.  
<https://doi.org/10.1016/j.applanim.2008.05.008>

White, L. J., Thomson, J. S., Pounder, K. C., Coleman, R. C., & Sneddon, L. U. (2017). **The impact of social context on behaviour and the recovery from welfare challenges in zebrafish, *Danio rerio*.** *Animal Behaviour*, 132, 189–199. <https://doi.org/10.1016/j.anbehav.2017.08.017>

Williams, TD; Readman, GD; Owen, SF. **Key issues concerning environmental enrichment for laboratory-held fish species.** *Laboratory animals* 43(2): 107-120.  
Online: <https://dx.doi.org/10.1258/la.2007.007023>

## Pigs

Averos, X., L. Brossard, J. Dourmad, K.H. Greef, H.L. Edge, S.A. Edwards, and M. Meunier-Salaun(2010). **A meta-analysis of the combined effect of housing and environmental enrichment characteristics on the behaviour and performance of pigs.** *Applied Animal Behaviour Science* 127(3-4): 73-85  
Online: <https://dx.doi.org/10.1016/j.applanim.2010.09.010>

Baumann, S., W. Pflanz, E. Gallmann, and L. Schrader (2013). **The effect of rubber mats on preference and lying behaviour of group housed sows.** *Landtechnik* 68(6): 385-388.

Bohnenkamp, A.-L., Traulsen, I., Meyer, C., Müller, K., & Krieter, J. (2013). **Comparison of growth performance and agonistic interaction in weaned piglets of different weight classes from farrowing systems with group or single housing.** *Animal*, 7(02), 309–315.  
<https://doi.org/10.1017/S175173112001541>

Camerlink, I., P. Bijma, B. Kemp, and J.E. Bolhuis (2012). **Relationship between growth rate and oral manipulation, social nosing, and aggression in finishing pigs.** *Applied Animal Behaviour Science* 142(1-2): 11-17.  
Online: <https://dx.doi.org/10.1016/j.applanim.2012.09.004>

Camerlink, I., S.P. Turner, W.W. Ursinus, I. Reimert, and J.E. Bolhuis (2014). **Aggression and affiliation during social conflict in pigs.** *PLOS One* 9(11): e113502.  
Online: <https://dx.doi.org/10.1371/journal.pone.0113502>

Clarke, T., Pluske, J. R., Miller, D. W., Collins, T., & Fleming, P. A. (2018). **Parity influences the demeanor of sows in group housing.** *Journal of Applied Animal Welfare Science*, 21(1), 17–26.

Cornale, P.; Macchi, E.; Miretti, S.; Renna, M.; Lussiana, C.; Perona, G.; Mimosi, A. (2015). **Effects of stocking density and environmental enrichment on behavior and fecal corticosteroid levels of pigs under commercial farm conditions.** *Journal of veterinary behavior: clinical applications and research* 10(6): 569-576  
Online: <https://dx.doi.org/10.1016/j.jveb.2015.05.002>

Croney, C. (2014). **Let's stay together: Implications of social housing for laboratory pig welfare and management.** *The Enrichment Record* 19: 14-19.  
Online: <http://enrichmentrecord.com/wp-content/uploads/2014/04/LETS-STAY-TOGETHER.pdf>

D'Eath, R.B. (2005). **Socialising piglets before weaning improves social hierarchy formation when pigs are mixed post-weaning.** *Applied Animal Behaviour Science* 93: 199-2011.  
Online: <https://dx.doi.org/10.1016/j.applanim.2004.11.019>

DeBoer, S.P., J.P. Garner, D.C. Lay Jr., S.D. Eicher, J.R. Lucas, and J.N. Marchant-Forde (2013). **Does the presence of a human affect the preference of enrichment items in young, isolated pigs?** *Applied Animal Behaviour Science* 143: 96-103.  
Online: <http://handle.nal.usda.gov/10113/56673>

Desire, S; Turner, SP; D'Eath, RB; Doeschl-Wilson, AB; Lewis, CRG; Roehe, R (2015). **Analysis of the phenotypic link between behavioural traits at mixing and increased long-term social stability in group-housed pigs.** *Applied animal behaviour science* 166: 52-62.  
Online: <https://dx.doi.org/10.1016/j.applanim.2015.02.015>

Durrell, J.L., I.A. Sneddon, N.E. O'Connell, and H. Whitehead. (2004). **Do pigs form preferential associations?** *Applied animal behaviour science* 89 (1-2): 41-52.  
Online: <https://dx.doi.org/10.1016/j.applanim.2004.05.003>

Fu, L.; Li, H.; Liang, T.; Zhou, B.; Chu, Q.; Schinckel, A.P.; Yang, X.; Zhao, R.; Li, P.; Huang, R. (2016). **Stocking density affects welfare indicators of growing pigs of different group sizes after regrouping.** *Applied animal behaviour science* 174: 42-50.  
Online: <https://dx.doi.org/10.1016/j.applanim.2015.10.002>

Jarvis, S, C. Moinard, S.K. Robson, E. Baxter, E. Ormandy, A.J. Douglas, J.R. Seckl, J.A. Russell, and A.B. Lawrence (2006). **Programming the offspring of the pig by prenatal social stress: Neuroendocrine activity and behavior.** *Hormones and Behavior* 49(1): 68-80  
Online: <https://dx.doi.org/10.1016/j.yhbeh.2005.05.004>

Koketsu, Y., & Iida, R. (2017). **Sow housing associated with reproductive performance in breeding herds.** *Molecular Reproduction and Development*, 84(9), 979–986.  
<https://doi.org/10.1002/mrd.22825>

Krauss, A.V. (2013). **Social behaviour of sows in dynamic groups - an important factor for the successful group housing.** *Praktische Tierarzt* 94(6): 545-548.

Lang, F.C., S.M. Hayne, and H.W. Gonyou (2012). **Effects of temperament and floor space allowance on sows at grouping.** *31st Annual Centralia Swine Research Update*, Kirkton-Woodham Community Centre, Ontario, Canada, p.II-40-II-42.  
Online: <http://www.prairieswine.com/eff-ects-of-temperament-and-floor-space-allowance-on-sows-at-grouping/>

Li, Y. Z., Wang, L. H., & Johnston, L. J. (2017). **Effects of social rank on welfare and performance of gestating sows housed in two group sizes.** *Journal of Swine Health and Production*, 25(6), 290–298.

Mack, L.A., D.C. Lay, S.D. Eicher, A.K. Johnson, B.T. Richert, and E.A. Pajor (2014). **Group space allowance has little effect on sow health, productivity, or welfare in a free-access stall system.** *Journal of Animal Science* 92(6): 2554-2567.

Online: <https://dx.doi.org/10.2527/jas.2013-7352>

Manteca, X., and S. Edwards (2009). **Feeding behaviour and social influences on feed intake.** *Voluntary feed intake in pigs*, Wageningen Academic Publishers: Wageningen , Netherlands, p.293-306.  
ISBN: 978-90-8686-096-8

McLeman, M.A., M.T. Mendl, R. B. Jones, and C. M. Wathes (2008). **Social discrimination of familiar conspecifics by juvenile pigs, *Sus scrofa*: Development of a non-invasive method to study the transmission of unimodal and bimodal cues between live stimuli.** *Applied Animal Behaviour Science* 115(3-4): 123-137.  
Online: <https://dx.doi.org/10.1016/j.applanim.2008.06.010>

Morgan, T., J. Pluske, D. Miller, T. Collins, A.L. Barnes, P.A. Fleming, and F. Wemelsfelder (2014). **Socialising piglets in lactation positively affects their post-weaning behaviour.** *Applied Animal Behaviour Science* 158: 23-33.  
Online: <https://dx.doi.org/10.1016/j.applanim.2014.06.001>

Munsterhjelm, C., E. Brunberg, M. Heinonen, L. Keeling, and A. Valros (2013). **Stress measures in tail biters and bitten pigs in a matched case-control study.** *Animal Welfare* 22(3): 331-338.

Rault, J.L. (2012). **Friends with benefits: Social support and its relevance for farm animal welfare.** *Applied Animal Behaviour Science* 136(1): 1-14.  
Online: <https://dx.doi.org/10.1016/j.applanim.2011.10.002>

Rault, J.L. (2017). **Social interaction patterns according to stocking density and time post-mixing in group-housed gestating sows.** *Animal Production Science* 57(5): 896-902.  
Online: <https://dx.doi.org/10.1071/AN15415>

Reimert, I., J.E. Bolhuis, B. Kemp, and T.B. Rodenburg (2012). **Indicators of positive and negative emotions and emotional contagion in pigs.** *Physiology & Behavior* 109: 42-50.  
Online: <https://dx.doi.org/10.1016/j.physbeh.2012.11.002>

Reimert, I., J.E. Bolhuis, B. Kemp, and T.B. Rodenburg (2014). **Social support in pigs with different coping styles.** *Physiology & Behavior* 129: 221-229.  
Online: <https://dx.doi.org/10.1016/j.physbeh.2014.02.059>

Rioja-Lang, F.C., S.M. Hayne, and H.W. Gonyou (2013). **The effect of pen design on free space utilization of sows group housed in gestation pens equipped with free access stalls.** *Applied Animal Behaviour Science* 148(1/2): 93-98.  
Online: <https://dx.doi.org/10.1016/j.applanim.2013.07.002>

Samarakone, T. S., and H.W. Gonyou (2009). **Domestic pigs alter their social strategy in response to social group size.** *Applied Animal Behaviour Science* 121(1): 8-15.  
Online: <https://dx.doi.org/10.1016/j.applanim.2009.08.006>

Scollo, A., S.A. Edwards, F. Gottardo, and B. Contiero (2014). **Does stocking density modify affective state in pigs as assessed by cognitive bias, behavioural and physiological parameters?** *Applied Animal Behaviour Science* 153: 26-35.  
Online: <https://dx.doi.org/10.1016/j.applanim.2014.01.006>

Smith, A.C, and M.M. Swindle (2006). **Preparation of swine for the laboratory.** *ILAR Journal* 47(4):358-363.  
Online: <http://ilarjournal.oxfordjournals.org/content/47/4/358.full.pdf>

Spoolder, H.A.M., A.A.J. Aarnink, H.M., Vermeer, J. van Riel, and S.A. Edwards (2012). **Effect of increasing temperature on space requirements of group housed finishing pigs.** *Applied Animal Behaviour Science* 138(3-4): 229-239.  
Online: <https://dx.doi.org/10.1016/j.applanim.2012.02.010>

Street, B. R., & Gonyou, H. W. (2008). **Effects of housing finishing pigs in two group sizes and at two floor space allocations on production, health, behavior, and physiological variables1.** *Journal of Animal Science*, 86(4), 982–991. <https://doi.org/10.2527/jas.2007-0449>

Tallet, C., A. Brilloueet, M. Meunier-Salauen, V. Paulmier, C. Guerin, and A. Prunier (2013). **Effects of neonatal castration on social behaviour, human-animal relationship and feeding activity in finishing pigs reared in a conventional or an enriched housing.** *Applied Animal Behaviour Science* 145(3-4): 70-83.  
Online: <https://dx.doi.org/10.1016/j.applanim.2013.03.001>

Thomsson, O; Bergqvist, AS; Sjunnesson, Y; Eliasson-Selling, L; Lundeheim, N; Magnusson, U (2015). **Aggression and cortisol levels in three different group housing routines for lactating sows.** *Acta veterinaria scandinavica* 57.  
Online: <https://dx.doi.org/10.1186/s13028-015-0101-7>

Toenepoehl ,B., A. K. Appel, S. Welp, B. Voss, U.K. von Borstel, and M. Gauly, M. (2012). **Effect of marginal environmental and social enrichment during rearing on pigs' reactions to novelty, conspecifics and handling.** *Applied Animal Behaviour Science* 140(3-4): 137-145.  
Online: <https://dx.doi.org/10.1016/j.applanim.2012.05.002>

Turner, Simon P., R.B. D'Eath, R. Roehe, and A.B. Lawrence. (2010). **Selection against aggressiveness in pigs at re-grouping: practical application and implications for long-term behavioural patterns.** *Animal Welfare* 19(Supp. 1): 123-132.

Turner, Simon P., M. Nath, G.W. Horgan, and S.A. Edwards. (2013). **Measuring chronic social tension in groups of growing pigs using inter-individual distances.** *Applied Animal Behaviour Science* 146(1-4): 26-36.  
Online: <https://dx.doi.org/10.1016/j.applanim.2013.03.012>

- van Nieuwamerongen, S. E., Mendl, M., Held, S., Soede, N. M., & Bolhuis, J. E. (2017). **Post-weaning social and cognitive performance of piglets raised pre-weaning either in a complex multi-suckling group housing system or in a conventional system with a crated sow.** *Animal Cognition*, 20(5), 907–921. <https://doi.org/10.1007/s10071-017-1110-x>
- van Nieuwamerongen, S.E., J.E. Bolhuis, C.M. van der Peet-Schowering, and N.M. Soede (2014). **A review of sow and piglet behaviour and performance in group housing systems for lactating sows.** *Animal* 8(3): 448-460.  
Online: <https://dx.doi.org/10.1017/S1751731113002280>
- Verdon, M.; Hansen, C.F.; Rault, J.-.; Jongman, E.; Hansen, L.U.; Plush, K.; Hemsworth, P.H. (2015). **Effects of group housing on sow welfare: a review.** *Journal of animal science* 93(5): 1999-2017.  
Online: <https://dx.doi.org/10.2527/jas.2014-8742>
- Widowski, T.M., Y. Yuan, and J.M. Gardner (2005). **Effect of accommodating sucking and nosing on the behaviour of artificially reared piglets.** *Laboratory Animals* 39(2): 240-250.  
Online: <https://dx.doi.org/10.1258/0023677053739701>
- Zhou, Q., Q. Sun, G. Wang, B. Zhou, M. Lu, J.N. Marchant-Forde, X. Yang, and R. Zhao (2014). **Group housing during gestation affects the behaviour of sows and the physiological indices of offspring at weaning.** *Animal* 8(7): 1162-1169.

## Rabbits

Andrist, C.A., L.M. Bigler, H.W. Würbel, and B.A. Roth (2012). **Effects of group stability on aggression, stress and injuries in breeding rabbits.** *Applied Animal Behaviour Science* 142(3/4): 182-188.  
Online: <https://dx.doi.org/10.1016/j.applanim.2012.10.017>

Andrist, C.A., L.M. Bigler, H.W. Würbel, and B.A. Roth (2014). **Masking odour when regrouping rabbit does: Effect on aggression, stress and lesions.** *Livestock Science* 170: 150-157.  
Online: <https://dx.doi.org/10.1016/j.livsci.2014.10.017>

Baumans, V. (2005). **Environmental enrichment for laboratory rodents and rabbits: Requirements of rodents, rabbits, and research.** *ILAR Journal* 46(2): 162-170.

Buijs, S., K. Hermans, L. Maertens, A. Van Caelenberg, and F.A. Tuyttens (2014). **Effects of semi-group housing and floor type on pododermatitis, spinal deformation and bone quality in rabbit does.** *Animal: an International Journal of Animal Bioscience* 8(10): 1728-1734.

Buijs, S.; Maertens, L.; Tuyttens, F.A.M.; Hermans, K.; Vangeyte, J. (2015). **Behaviour, wounds, weight loss and adrenal weight of rabbit does as affected by semi-group housing.** *Applied animal behaviour science* 172: 44-51.  
Online: <https://dx.doi.org/10.1016/j.applanim.2015.09.003>

Buijs, S., L. Maertens, F.A.M. Tuyttens, L.J. Keeling, and S. Rettenbacher (2011). **Glucocorticoid metabolites in rabbit faeces-Influence of environmental enrichment and cage size.** *Physiology and Behavior* 104(3): 469-473.  
Online: <https://dx.doi.org/10.1016/j.physbeh.2011.05.008>

Buijs, S., J. Vangeyte, F.A.M. Tuyttens (2016). **Effects of communal rearing and group size on breeding rabbits' post-grouping behaviour and its relation to ano-genital distance.** *Applied animal behaviour science* 182: 53-60.  
Online: <https://dx.doi.org/10.1016/j.applanim.2016.06.005>

Carter, C.L.; Adams, J.K.; Czarra, J.A.; Coan, P.N. (2016). **An Incidence of Pseudopregnancy Associated with the Social Enrichment of Rabbits (*Oryctolagus cuniculi*).** *Journal of the american association for laboratory animal science* 55(1): 98-99.

Chu, L.R., J.P. Garner, and J.A. Mench (2004). **A behavioral comparison of New Zealand White rabbits (*Oryctolagus cuniculus*) housed individually or in pairs in conventional laboratory cages.** *Applied Animal Behaviour Science* 85(1-2): 121-139.  
Online: <https://dx.doi.org/10.1016/j.applanim.2003.09.011>

Dalle Zotte, A., Z. Princz, Z. GerencsĂ, S. Metzger, Z. Szendro, and Z. Matics (2009). **Rabbit preference for cages and pens with or without mirrors.** *Applied Animal Behaviour Science* 116(2-4): 273-278.  
Online: <https://dx.doi.org/10.1016/j.applanim.2008.08.011>

DiVincenti, L. and A.N. Rehrig (2016). **The Social Nature of European Rabbits (*Oryctolagus cuniculus*)**.

*Journal of the American Association for Laboratory Animal Science: JAALAS* 55(6): 729-736.

Online: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC5113872/>

DiVincenti, L. and A.N. Rehrig (2017). **Social Behavior of Adult Male New Zealand White Rabbits Housed in Groups or Pairs in the Laboratory**. *Journal of Applied Animal Welfare Science* 20(1):

86-94.

Online: <https://dx.doi.org/10.1080/10888705.2016.1247352>

Drion, P. and R. Dewree (2006). **Towards a better use of the rabbit as an experimental model: Review and perspectives**. *Annales De Medecine Veterinaire* 150(3): 153-162.

Fuentes, G.C. and J. Newgren (2008). **Physiology and clinical pathology of laboratory New Zealand white rabbits housed individually and in groups**. *Journal of the American Association for Laboratory Animal Science* 47(2): 35-38.

Held, S. D. E., Turner, R. J., & Wooton, R. J. (1995). **Choices of laboratory rabbits for individual or group-housing**. *Applied Animal Behaviour Science*, 46(1), 81–91.

Hoy, S. (2009). **Rabbit housing with respect to animal welfare**. *Deutsche Tierarztliche Wochenschrift* 116(3): 97-100.

Online: <https://dx.doi.org/10.2376/0341-6593-116-97>

Hoy, St., M. Ruis, and Zs. Szendroe (2006). **Housing of rabbits - Results of a European research network**. *Archiv Fur Geflugelkunde* 70(5): 223-227.

Johnson, C.A., W.A. Pallozzi, N.P. Dahl, J.A. Destefano, S.J. Pratt, M. Gallagher Alat, H.J. Klein, J.L. Szumiloski, S.J. Hall, C.M. Beare, L. Geiger, and L. Castiglia (2003). **The effect of an environmental enrichment device on individually caged rabbits in a safety assessment facility**. *Contemporary Topics in Laboratory Animal Science* 42(5): 27-30.

Matic, Z., Szendrő, Z., Odermatt, M., Gerencsér, Z., Nagy, I., Radnai, I., & Zotte, A. D. (2014). **Effect of housing conditions on production, carcass and meat quality traits of growing rabbits**. *Meat Science*, 96(1), 41–46. <https://doi.org/10.1016/j.meatsci.2013.07.001>

Mikó, A., S. Matic, Z. Gerencsér, M. Odermatt, I. Radnai, I. Nagy, K. Szendrő, and Z. Szendrő (2014). **Performance and welfare of rabbit does in various caging systems**. *Animal* 8(7): 1146-1152. Online: <https://dx.doi.org/10.1017/S1751731114001244>

Mirabito, L. (2007). **Housing and welfare of rabbits: More questions than answers**. *Productions Animales* 20(1): 59-64.

Mugnai, C., A. Dal Bosco, and C. Castellini (2009). **Effect of different rearing systems and pre-kindling handling on behaviour and performance of rabbit does**. *Applied Animal Behaviour Science* 118(1-2): 91-100.

Online: <https://dx.doi.org/10.1016/j.applanim.2009.02.007>

Nevalainen, T.O., F.A. Guhad, C.M. Lang, and J.I. Nevalainen (2007). **Pair housing of rabbits reduces variances in growth rates and serum alkaline phosphatase levels.** *Laboratory Animals* 41(4): 432-440.  
Online: <https://dx.doi.org/10.1258/002367707782314247>

Onbasilar, E.E. and I. Onbasilar (2007). **Effect of cage density and sex on growth, food utilization and some stress parameters of young rabbits.** *Scandinavian Journal of Laboratory Animal Science* 34(3): 189-195.

Poggiagliolmi, S., S.L. Crowell-Davis, L.C. Alworth, and S.B. Harvey (2011). **Environmental enrichment of New Zealand White rabbits living in laboratory cages.** *Journal of Veterinary Behavior: Clinical Applications and Research* 6(6): 343-350.  
Online: <https://dx.doi.org/10.1016/j.jveb.2010.12.001>

Princz, Z., I. Radnai, E. Bameth, Z. Matics, Z. Gerencsér, I. Nagy, Z. Szendro, and A. Dalle Zotte (2008). **Behaviour of growing rabbits under various housing conditions.** *Applied Animal Behaviour Science* 111(3-4): 342-356.  
Online: <https://dx.doi.org/10.1016/j.applanim.2007.06.013>

Reinhardt, V. (2004). **Common husbandry-related variables in biomedical research with animals.** *Laboratory Animals* 38(3): 213-235.  
Online: <https://dx.doi.org/10.1258/002367704323133600>

Rommers, J.M., I. De Jong, C. Boiti, and G. Breccchia (2006). **Performance and behaviour of rabbit does in a group-housing system with natural mating or artificial insemination.** *Reproduction Nutrition Development* 46(6): 677-687.  
Online: <https://dx.doi.org/10.1051/rnd:2006038>

Rommers, J.M., B.J.F. Reuvekamp, H. Gunnink, and I.C. de Jong (2014). **Effect of hiding places, straw and territory on aggression in group-housed rabbit does.** *Applied Animal Behaviour Science* 157: 117-126.  
Online: <https://dx.doi.org/10.1016/j.applanim.2014.05.011>

Seaman, S.C., N.K. Waran, G. Mason, and R.B. D'Eath (2008). **Animal economics: assessing the motivation of female laboratory rabbits to reach a platform, social contact and food.** *Animal Behaviour* 75(1): 31-42.  
Online: <https://dx.doi.org/10.1016/j.anbehav.2006.09.031>

Szendro, Z. and J.I. McNitt (2012). **Housing of rabbit does: group and individual systems: a review.** *Livestock Science* 150(1/3): 1-10.

Szendro, Z., A. Miko, M. Odermatt, Z. Gerencser, I. Radnai, B. Dezser, E. Garai, I. Nagy, K. Szendro, and Z. Matics (2013). **Comparison of performance and welfare of single-caged and group-housed rabbit does.** *Animal* 7(3): 463-468.  
Online: <https://dx.doi.org/10.1017/S1751731112001760>

Szendro, K; Szendro, Z; Matics, Z; Zotte, AD; Odermatt, M; Radnai, I; Gerencser, Z (2015). **Effect of**

**genotype, housing system and hay supplementation on performance and ear lesions of growing rabbits.** *Livestock science* 174: 105-112.  
Online: <https://dx.doi.org/10.1016/j.livsci.2015.01.008>

Thurston, S., Burlingame, L., Lester, P. A., & Lofgren, J. (2018). **Methods of Pairing and Pair Maintenance of New Zealand White Rabbits (*Oryctolagus Cuniculus*) Via Behavioral Ethogram, Monitoring, and Interventions.** *Journal of Visualized Experiments: JoVE*, (133).

Trocino, A., Majolini, D., Tazzoli, M., Filou, E., & Xiccato, G. (2013). **Housing of growing rabbits in individual, bicellular and collective cages: fear level and behavioural patterns.** *Animal*, 7(04), 633–639. <https://doi.org/10.1017/S1751731112002029>

Valuska, A.J. and J.A. Mench (2013). **Size does matter: The effect of enclosure size on aggression and affiliation between female New Zealand White rabbits during mixing.** *Applied Animal Behaviour Science* 149(1-4): 72-76.  
Online: <https://dx.doi.org/10.1016/j.applanim.2013.10.002>

Verwer, C.M., R. van den Bos, C.F.M. Hendriksen, and G. van Amerongen (2009). **Handling effects on body weight and behaviour of group-housed male rabbits in a laboratory setting.** *Applied Animal Behaviour Science* 117(1-2): 93-102.  
Online: <https://dx.doi.org/10.1016/j.applanim.2008.12.004>

Zomeño, C., Birolo, M., Gratta, F., Zuffellato, A., Xiccato, G., & Trocino, A. (2018). **Effects of group housing system, pen floor type, and lactation management on performance and behaviour in rabbit does.** *Applied Animal Behaviour Science*, 203, 55–63.

Zomeño, C., Birolo, M., Zuffellato, A., Xiccato, G., & Trocino, A. (2017). **Aggressiveness in group-housed rabbit does: Influence of group size and pen characteristics.** *Applied Animal Behaviour Science*, 194, 79–85.

## Rodents

- Agren, G. and B.J. Meyerson (1977). **Influence of gonadal hormones and social housing conditions on agonistic, copulatory, and related sociosexual behaviour in the Mongolian gerbil (*Meriones unguiculatus*)**. *Behavioural Processes* 2(3): 265-282.  
Online: [https://dx.doi.org/10.1016/0376-6357\(77\)90030-4](https://dx.doi.org/10.1016/0376-6357(77)90030-4)
- Arndt, S.S., M. Laarakker, R. Sommer, I. Lemmens, X. Fielmich, H.A. Van Lith, and F. Ohl (2006). **Social housing in male mice - impact on experimental anxiety-related behaviour?** *European Neuropsychopharmacology* 16(Suppl. 4).
- Arndt, S.S., M.C. Laarakker, H.A. van Lith, A.R. Salomons, J. van't Klooster, F. Ohl, F.J. van der Staay, and E. Gieling (2009). **Individual housing of mice - Impact on behaviour and stress responses.** *Physiology and Behavior* 97(3-4): 385-393.  
Online: <https://dx.doi.org/10.1016/j.physbeh.2009.03.008>
- Baker, S. and C. Bielajew (2007). **Influence of housing on the consequences of chronic mild stress in female rats.** *Stress* 10(3): 283-293.  
Online: <https://dx.doi.org/10.1080/10253890701265362>
- Bailoo, J. D., Murphy, E., Varholick, J. A., Novak, J., Palme, R., & Würbel, H. (2018). **Evaluation of the effects of space allowance on measures of animal welfare in laboratory mice.** *Scientific Reports*, 8(1), 713.
- Bartal, I.B., D.A. Rodgers, M.S. Sarria, J. Decety, and P. Mason (2014). **Pro-social behavior in rats is modulated by social experience.** *eLife* 3.  
Online: <https://dx.doi.org/10.7554/eLife.01385.001>
- Bartolomucci, A. (2007). **Social stress, immune functions and disease in rodents.** *Frontiers in Neuroendocrinology* 28(1): 28-49.  
Online: <https://dx.doi.org/10.1016/j.yfrne.2007.02.001>
- Bartolomucci, A., P. Palanza, A. Chirieleison, S. Parmigiani, P. Sacerdote, A.E. Panerai, and G. Ceresini (2003). **Individual housing induces altered immuno-endocrine responses to psychological stress in male mice.** *Psychoneuroendocrinology* 28(4): 540-558.  
Online: [https://dx.doi.org/10.1016/S0306-4530\(02\)00039-2](https://dx.doi.org/10.1016/S0306-4530(02)00039-2)
- Burgdorf, J. and J. Panksepp (2001). **Tickling induces reward in adolescent rats.** *Physiology and Behavior* 72(1-2): 167-173.  
Online: [https://dx.doi.org/10.1016/S0031-9384\(00\)00411-X](https://dx.doi.org/10.1016/S0031-9384(00)00411-X)
- Burman, O., L. Buccarello, V. Redaelli, and L. Cervo (2014). **The effect of two different Individually Ventilated Cage systems on anxiety-related behaviour and welfare in two strains of laboratory mouse.** *Physiology & Behavior* 124: 92-99.  
Online: <https://dx.doi.org/10.1016/j.physbeh.2013.10.019>
- Burn, C.C. (2008). **What is it like to be a rat? Rat sensory perception and its implications for**

**experimental design and rat welfare.** *Applied Animal Behaviour Science* 112(1-2): 1-32.  
Online: <https://dx.doi.org/10.1016/j.applanim.2008.02.007>

Burn, C.C., A. Peters, and G.J. Mason (2006). **Acute effects of cage cleaning at different frequencies on laboratory rat behaviour and welfare.** *Animal Welfare* 15(2): 161-171.

Buwalda, B., M. Geerdink, J. Vidal, and J.M. Koolhaas (2011). **Social behavior and social stress in adolescence: A focus on animal models.** *Neuroscience and Biobehavioral Reviews* 35(8): 1713-1721.  
Online: <https://dx.doi.org/10.1016/j.neubiorev.2010.10.004>

Cloutier, S., C. Baker, K. Wahl, J. Panksepp, and R.C. Newberry (2013). **Playful handling as social enrichment for individually- and group-housed laboratory rats.** *Applied Animal Behaviour Science* 143(2-4): 85-95.  
Online: <https://dx.doi.org/10.1016/j.applanim.2012.10.006>

Cloutier, S., J. Panksepp, and R.C. Newberry (2012). **Playful handling by caretakers reduces fear of humans in the laboratory rat.** *Applied Animal Behaviour Science* 140(3-4): 161-171.  
Online: <https://dx.doi.org/10.1016/j.applanim.2012.06.001>

Doulames, V., S. Lee, and T.B. Shea (2014). **Environmental enrichment and social interaction improve cognitive function and decrease reactive oxidative species in normal adult mice.** *The International Journal of Neuroscience* 124(5): 369-376.

Febinger, H.Y., A. George, J. Priestley, L.A. Toth, and M.R. Opp (2014). **Effects of housing condition and cage change on characteristics of sleep in mice.** *Journal of the American Association for Laboratory Animal Science* 53(1): 29-37.

Fuss, J., S.H. Richter, J. Steinle, G. Deubert, R. Hellweg, and P. Gass (2013). **Are you real? Visual simulation of social housing by mirror image stimulation in single housed mice.** *Behavioural Brain Research* 243: 191-198.  
Online: <https://dx.doi.org/10.1016/j.bbr.2013.01.015>

Gaskill, B. (2014). **Aggression in laboratory mice: Potential influences and how to manage it.** *The Enrichment Record* 18: 22-25.  
Online: <http://enrichmentrecord.com/wp-content/uploads/2014/01/AGGRESSION-IN-LAB-MICE.pdf>

Gaskill, B.N.; Pritchett-Corning, K.R. (2015). **Effect of cage space on behavior and reproduction in Crl:CD(SD) and BN/Crl laboratory rats.** *Journal of the American association for laboratory animal science* 54(5): 497-506.

Gasparotto, O.C., D.M. Lopes, and S.G. Carobrez (2005). **Pair housing affects anxiety-like behaviors induced by a social but not by a physiological stressor in male Swiss mice.** *Physiology and Behavior* 85(5): 603-612.  
Online: <https://dx.doi.org/10.1016/j.physbeh.2005.06.014>

- Greenberg, G.D., C.L. Howerton, and B.C. Trainor (2014). **Fighting in the home cage: Agonistic encounters and effects on neurobiological markers within the social decision-making network of house mice (*Mus musculus*)**. *Neuroscience Letters* 566: 151-155.  
Online: <https://dx.doi.org/10.1016/j.neulet.2014.02.051>
- Grégoire, C., D. Bonenfant, A. Le Nguyen, A. Aumont, and K.J. Fernandes (2014). **Untangling the influences of voluntary running, environmental complexity, social housing and stress on adult hippocampal neurogenesis**. *PLOS One* 9(1).  
Online: <https://dx.doi.org/10.1371/journal.pone.0086237>
- Grippo, A.J., E. Ihm, J. Wardwell, N. McNeal, M.L. Scotti, D.A. Moenk, D.L. Chandler, M.A. LaRocca, and K. Preihs (2014). **The effects of environmental enrichment on depressive and anxiety-relevant behaviors in socially isolated prairie voles**. *Psychosomatic Medicine* 76(4): 277-284.  
Online: <https://dx.doi.org/10.1097/PSY.0000000000000052>
- Gudsnuik, K. and F.A. Champagne (2012). **Epigenetic influence of stress and the social environment**. *Ilar Journal* 53(3-4): 279-288.  
Online: <https://dx.doi.org/10.1093/ilar.53.3-4.279>
- Halpin, Z.T. and K.C. Noonan (1982). **Social housing and odor preferences in the mongolian gerbil *Meriones-unguiculatus***. *Biology of Behaviour* 7(4): 293-302.
- Harper, L.; Choleris, E.; Ervin, K.; Fureix, C.; Reynolds, K.; Walker, M.; Mason, G. (2015). **Stereotypic mice are aggressed by their cage-mates, and tend to be poor demonstrators in social learning tasks**. *Animal welfare* 24(4): 463-473.
- Hennessy, M.B., S. Kaiser, and N. Sachser (2009). **Social buffering of the stress response: Diversity, mechanisms, and functions**. *Frontiers in Neuroendocrinology* 30(4): 470-482.  
Online: <https://dx.doi.org/10.1016/j.yfrne.2009.06.001>
- Hennessy, M.B. and A. Morris (2005). **Passive responses of young guinea pigs during exposure to a novel environment: Influences of social partners and age**. *Developmental Psychobiology* 46(2): 86-96.  
Online: <https://dx.doi.org/10.1002/dev.20045>
- Hori, M., K. Yamada, J. Ohnishi, S. Sakamoto, H. Furuie, K. Murakami, and Y. Ichitani (2014). **Tickling during adolescence alters fear-related and cognitive behaviors in rats after prolonged isolation**. *Physiology & Behavior* 131: 62-67.  
Online: <https://dx.doi.org/10.1016/j.physbeh.2014.04.008>
- Jensen, V.F.H., A. Mølck, M. Mårtensson, M.A. Strid, M. Chapman, J. Lykkesfeldt, and I.B. Bøgh (2017). **Assessment of implantable infusion pumps for continuous infusion of human insulin in rats: potential for group housing**. *Laboratory Animals* 51(3): 273-283.  
Online: <https://dx.doi.org/10.1177/0023677216660740>
- Jirkof, P. (2015). **Effects of experimental housing conditions on recovery of laboratory mice**. *Lab animal* 44(2): 65-70.

- Jirkof, P., N. Cesarovic, A. Rettich, T. Fleischmann, and M. Arras (2012). **Individual housing of female mice: influence on postsurgical behaviour and recovery.** *Laboratory Animals* 46(4): 325-334.  
Online: <https://dx.doi.org/10.1258/la.2012.012027>
- Kamakura, R.; Kovalainen, M.; Leppäluoto, J.; Herzig, K.; Mäkelä, K.A. (2016). **The effects of group and single housing and automated animal monitoring on urinary corticosterone levels in male C57BL/6 mice.** *Physiological reports* 4(3).
- Keesom, S. M., Morningstar, M. D., Sandlain, R., Wise, B. M., & Hurley, L. M. (2018). **Social isolation reduces serotonergic fiber density in the inferior colliculus of female, but not male, mice.** *Brain Research*, 1694, 94–103.
- Keesom, S.M., C.J. Finton, G.L. Sell, L.M. Hurley, and M.J. Coleman (2017). **Early-Life Social Isolation Influences Mouse Ultrasonic Vocalizations during Male-Male Social Encounters.** *PLOS One* 12(1): e0169705.  
Online: <https://dx.doi.org/10.1371/journal.pone.0169705>
- Kenkel, W.M. and C.S. Carter (2016). **Voluntary Exercise Facilitates Pair-Bonding in Male Prairie Voles.** *Behavioural brain research* 296: 326-330.  
Online: <https://dx.doi.org/10.1016/j.bbr.2015.09.028>
- Kiyokawa, Y., A. Ishida, Y. Takeuchi, and Y. Mori (2016). **Sustained housing-type social buffering following social housing in male rats.** *Physiology & Behavior* 158: 85-89.  
Online: <https://dx.doi.org/10.1016/j.physbeh.2016.02.040>
- Kruegel, U., J. Fischer, K. Bauer, U. Sack, and H. Himmerich (2014). **The impact of social isolation on immunological parameters in rats.** *Archives of Toxicology* 88(3): 853-855.  
Online: <https://dx.doi.org/10.1007/s00204-014-1203-0>
- Kulesskaya, N., N.N. Karpova, L. Ma, L. Tian, and V. Voikar (2014). **Mixed housing with DBA/2 mice induces stress in C57BL/6 mice: implications for interventions based on social enrichment.** *Frontiers in Behavioral Neuroscience* 8.
- Lee, Y.-A., Obora, T., Bondonny, L., Toniolo, A., Mivuelle, J., Yamaguchi, Y., Goto, Y. (2018). **The Effects of Housing Density on Social Interactions and Their Correlations with Serotonin in Rodents and Primates.** *Scientific Reports*, 8(1), 3497.
- Leshem, M. and M. Sherman (2006). **Troubles shared are troubles halved: Stress in rats is reduced in proportion to social propinquity.** *Physiology and Behavior* 89(3): 399-401.  
Online: <https://dx.doi.org/10.1016/j.physbeh.2006.07.010>
- Lidfors, L., A. Wichman, B. Ewaldsson, and A. Lindh (2014). **Enriched cages for groups of laboratory male rats and their effects on behaviour, weight gain and adrenal glands.** *Laboratory Animals* 48(1): 36-49.  
Online: <https://dx.doi.org/10.1177/0023677213505085>
- Liu, Y.J., L.F. Li, Y.H. Zhang, H. F. Guo, M. Xia, M.W. Zhang, X.Y. Jing, J.H. Zhang, and J.X. Zhang (2017).

**Chronic Co-Species Housing Mice and Rats Increased the Competitiveness of Male Mice.**

*Chemical Senses* 42(3): 247-257.

Online: <https://www.ncbi.nlm.nih.gov/labs/articles/28073837/>

Liu, X., Wu, R., Tai, F., Ma, L., Wei, B., Yang, X., ... Jia, R. (2013). **Effects of group housing on stress induced emotional and neuroendocrine alterations.** *Brain Research*, 1502, 71–80.

Maher, RL; Barbash, SM; Lynch, DV; Swoap, SJ (2015). **Group housing and nest building only slightly ameliorate the cold stress of typical housing in female C57BL/6J mice.** *American journal of physiology-regulatory integrative and comparative physiology* 308(12): R1070-R1079.

Online: <https://dx.doi.org/10.1152/ajpregu.00407.2014>

Mason, G.J. and N.R. Latham (2004). **Can't stop, won't stop: Is stereotypy a reliable animal welfare indicator?** *Animal Welfare* 13(SUPPL.).

Meijer, M.K., K. Kramer, R. Remie, B.M. Spruijt, L.F. van Zutphen, and V. Baumans (2006). **The effect of routine experimental procedures on physiological parameters in mice kept under different husbandry conditions.** *Animal Welfare* 15(1): 31-38.

Menich, S.R. and A. Baron (1984). **Social housing of rats: Life-span effects on reaction time, exploration, weight, and longevity.** *Experimental Aging Research* 10(2): 95-100.

Monteiro, B.M., F.A. Moreira, A.R. Massensini, M.F. Moraes, and G.S. Pereira (2014). **Enriched environment increases neurogenesis and improves social memory persistence in socially isolated adult mice.** *Hippocampus* 24(2): 239-248.

Online: <https://dx.doi.org/10.1002/hipo.22218>

O'Conno, R., & Eikelboom, R. (n.d.). The effects of changes in housing on feeding and wheel running. *Physiology & Behavior*, 68(3), 361–371.

Olsson, I.A.S. and K. Westlund (2007). **More than numbers matter: The effect of social factors on behaviour and welfare of laboratory rodents and non-human primates.** *Applied Animal Behaviour Science* 103(3-4): 229-254.

Online: <https://dx.doi.org/10.1016/j.applanim.2006.05.022>

Pan, Y., M. Li, C. Lieberwirth, Z. Wang, and Z. Zhang (2014). **Social defeat and subsequent isolation housing affect behavior as well as cell proliferation and cell survival in the brains of male greater long-tailed hamsters.** *Neuroscience* 265: 226-237.

Online: <https://dx.doi.org/10.1016/j.neuroscience.2014.01.056>

Paul, M.J., P. Indic, and W.J. Schwartz (2014). **Social forces can impact the circadian clocks of cohabiting hamsters.** *Proceedings of the Royal Society B: Biological Sciences* 281(1779).

Online: <https://dx.doi.org/10.1098/rspb.2013.2535>

Patterson-Kane, E.G., M. Hunt, and D. Harper (2002). **Rats demand social contact.** *Animal Welfare* 11(3): 327-332.

- Patterson-Kane, E.P., M. Hunt, and D. Harper (2004). **Short communication: Rat's demand for group size.** *Journal of Applied Animal Welfare Science* 7(4): 267-272.  
Online: [https://dx.doi.org/10.1207/s15327604jaws0704\\_4](https://dx.doi.org/10.1207/s15327604jaws0704_4)
- Pinnell, R.C.; Almajidy, R.K.; Hofmann, U.G. (2016). **Versatile 3D-printed headstage implant for group housing of rodents.** *Journal of neuroscience methods* 257: 134-138.
- Reinhardt, V. (2004). **Common husbandry-related variables in biomedical research with animals.** *Laboratory Animals* 38(3): 213-235.  
Online: <https://dx.doi.org/10.1258/002367704323133600>
- Ross, A.P., A. Norville, D.C. Choi, J.C. Walton, H.E. Albers, and K.L. Huhman (2017). **Social housing and social isolation: Impact on stress indices and energy balance in male and female Syrian hamsters (*Mesocricetus auratus*).** *Physiology & Behavior* 177: 264-269.  
Online: <https://dx.doi.org/10.1016/j.physbeh.2017.05.015>
- Sharp, J., T. Azar, and D. Lawson (2014). **Effects of a complex housing environment on heart rate and blood pressure of rats at rest and after stressful challenges.** *Journal of the American Association for Laboratory Animal Science* 53(1): 52-60.
- Sherwin, C.M. (2004). **The influences of standard laboratory cages on rodents and the validity of research data.** *Animal Welfare* 13(SUPPL.1): 9-15.
- Shoji, H., & Mizoguchi, K. (2011). **Aging-related changes in the effects of social isolation on social behavior in rats.** *Physiology & Behavior*, 102(1), 58–62.  
<https://doi.org/10.1016/j.physbeh.2010.10.001>
- Späni, D., B. König, M. Arras, and T. Rülicke (2003). **Higher heart rate of laboratory mice housed individually vs in pairs.** *Laboratory Animals* 37(1): 54-62.  
Online: <https://dx.doi.org/10.1258/002367703762226692>
- Sørensen, D., Hanse, H., Krohn, T., & Bertelsen, T. (2010). **Preferences for limited versus no contact in SD rats.** *Laboratory Animals*, 44(3), 274–277. <https://doi.org/10.1258/la.2010.009099>
- Sørensen, D.B., T. Krohn, A.K. Hansen, H.N. Hansen, and J.L. Ottesen (2005). **An ethological approach to housing requirements of golden hamsters, Mongolian gerbils and fat sand rats in the laboratory - A review.** *Applied Animal Behaviour Science* 94(3-4): 181-195.  
Online: <https://dx.doi.org/10.1016/j.applanim.2005.02.004>
- Taylor, K. (2010). **Reporting the implementation of the Three Rs in European primate and mouse research papers: Are we making progress?** *Atla Alternatives to Laboratory Animals* 38(6): 495-517.
- Tuetting, P. and G. Pinna (2002). **Behavior associated with an enriched environment and with social isolation in mice.** *Society for Neuroscience Abstract Viewer and Itinerary Planner* 2002.
- Turner, P.V., K.L. Smiler, M. Hargaden, and M.A. Koch (2003). **Refinements in the Care and Use of**

**Animals in Toxicology Studies - Regulation, Validation, and Progress. Contemporary Topics in Laboratory Animal Science** 42(6): 8-15.

Turner, P.V., J. Sunohara-Nelson, J. Ovari, A. Healy, and F. Leri (2014). **Effects of single compared with pair housing on hypothalamic-pituitary-adrenal axis activity and low-dose heroin place conditioning in adult male Sprague-Dawley rats.** *Journal of the American Association for Laboratory Animal Science* 53(2): 161-167.

van Goethem, N.P., K. Rutten, S. Akkerman, H.W.M. Steinbusch, J. Prickaerts, L.A.W. Jans, A. Blokland, F.J. van der Staay, and J. van't Klooster (2012). **Object recognition testing: Rodent species, strains, housing conditions, and estrous cycle.** *Behavioural Brain Research* 232(2): 323-334. Online: <https://dx.doi.org/10.1016/j.bbr.2012.03.023>

Van Loo, P.L.P., N. Kuin, R. Sommer, V. Baumans, H. Avsaroglu, and T. Pham (2007). **Impact of 'living apart together' on postoperative recovery of mice compared with social and individual housing.** *Laboratory Animals* 41(4): 441-455.

Online: <https://dx.doi.org/10.1258/002367707782314328>

Vaughan, L.M., J.S. Dawson, P.R. Porter, and A.L. Whittaker (2014). **Castration promotes welfare in group-housed male Swiss outbred mice maintained in educational institutions.** *Journal of the American Association for Laboratory Animal Science* 53(1): 38-43.

Verma, R., B.D. Friedler, N.M. Harris, and L.D. McCullough (2014). **Pair housing reverses post-stroke depressive behavior in mice.** *Behavioural Brain Research* 269: 155-163. Online: <https://dx.doi.org/10.1016/j.bbr.2014.04.044>

Verwer, C.M., R.V.D. Bos, C.F.M. Hendriksen, and L.T.M. van der Ven (2007). **Effects of housing condition on experimental outcome in a reproduction toxicity study.** *Regulatory Toxicology and Pharmacology* 48(2): 184-193. Online: <https://dx.doi.org/10.1016/j.yrtph.2007.03.004>

Wang, Y.-C., Wang, C.-C., Lee, C.-C., & Huang, A. C. W. (2010). **Effects of single and group housing conditions and alterations in social and physical contexts on amphetamine-induced behavioral sensitization in rats.** *Neuroscience Letters*, 486(1), 34–37. <https://doi.org/10.1016/j.neulet.2010.09.039>

Weber, E.M., J.A. Dallaire, B.N. Gaskill, K.R. Pritchett-Corning, and J.P. Garner (2017). **Aggression in group-housed laboratory mice: why can't we solve the problem?** *Lab Animal* 46: 157-161. Online: <https://dx.doi.org/10.1038/laban.1219>

Weil, Z.M., J.L. Workman, and R.J. Nelson (2007). **Housing condition alters immunological and reproductive responses to day length in Siberian hamsters (*Phodopus sungorus*).** *Hormones and Behavior* 52(2): 261-266. Online: <https://dx.doi.org/10.1016/j.yhbeh.2007.05.001>

Westenbroek, C., J.A. Den Boer, M. Gerrits, D.S. Fokkema, G.J. Ter Horst, and T.A.B. Snijders (2005).

**Pair-housing of male and female rats during chronic stress exposure results in gender-specific behavioral responses.** *Hormones and Behavior* 47(5): 620-628.  
Online: <https://dx.doi.org/10.1016/j.yhbeh.2005.01.004>

Westenbroek, C., J.A. Den Boer, G.J. Ter Horst, and M. Veenhuis (2004). **Chronic stress and social housing differentially affect neurogenesis in male and female rats.** *Brain Research Bulletin* 64(4): 303-308.  
Online: <https://dx.doi.org/10.1016/j.brainresbull.2004.08.006>

## Ruminants

- Abdelfattah, E. M., Schutz, M. M., Lay Jr, D. C., Marchant-Forde, J. N., & Eicher, S. D. (2013). Effect of group size on behavior, health, production, and welfare of veal calves. *Journal of Animal Science*, 91(11), 5455–5465.
- Aschwanden, J., L. Gygax, B. Wechsler, and N.M. Keil (2009). **Loose housing of small goat groups: Influence of visual cover and elevated levels on feeding, resting and agonistic behaviour.** *Applied Animal Behaviour Science* 119(3-4): 171-179.  
Online: <https://dx.doi.org/10.1016/j.applanim.2009.04.005>
- Aschwanden, J., Gygax, L., Wechsler, B., & Keil, N. M. (2008). Social distances of goats at the feeding rack: Influence of the quality of social bonds, rank differences, grouping age and presence of horns. *Applied Animal Behaviour Science*, 114(1–2), 116–131.
- Bøe, K.E. and G. Færevik (2003). **Grouping and social preferences in calves, heifers and cows.** *Applied Animal Behaviour Science* 80(3): 175-190.  
Online: [https://dx.doi.org/10.1016/S0168-1591\(02\)00217-4](https://dx.doi.org/10.1016/S0168-1591(02)00217-4)
- Caroprese, M., L. Schena, A. Muscio, A. Sevi, G. Annicchiarico, and R. Migliore (2009). **Influence of space allowance and housing conditions on the welfare, immune response and production performance of dairy ewes.** *Journal of Dairy Research* 76 (1): 66-73.  
Online: <https://dx.doi.org/10.1017/S0022029908003683>
- Chua, B., E. Coenen, J. Van Delen, and D.M. Weary (2002). **Effects of pair versus individual housing on the behavior and performance of dairy calves.** *Journal of Dairy Science* 85(2): 360-364.
- Cobb, C.J., B.S. Obeidat, M.D. Sellers, A.R. Pepper-Yowell, and M.A. Ballou (2014). **Group housing of Holstein calves in a poor indoor environment increases respiratory disease but does not influence performance or leukocyte responses.** *Journal of Dairy Science* 97(5): 3099-3109.  
Online: <https://dx.doi.org/10.3168/jds.2013-7823>
- Cobb, C.J., B.S. Obeidat, M.D. Sellers, A.R. Pepper-Yowell, D.L. Hanson, and M.A. Ballou (2014). **Improved performance and heightened neutrophil responses during the neonatal and weaning periods among outdoor group-housed Holstein calves.** *Journal of Dairy Science* 97(2): 930-939.
- Cook, N.B. and R.A. Smith (2008). **Designing welfare-friendly housing for dairy cows.** *Proceedings of the 41st Annual Conference of the American Association of Bovine Practitioners, Charlotte, North Carolina, USA, 25-27 September 2008:* 78-84.
- Costa, J. H. C., von Keyserlingk, M. A. G., & Weary, D. M. (2016). Invited review: Effects of group housing of dairy calves on behavior, cognition, performance, and health. *Journal of Dairy Science*, 99(4), 2453–2467.
- Costa, J. H. C., Daros, R. R., von Keyserlingk, M. A. G., & Weary, D. M. (2014). Complex social housing reduces food neophobia in dairy calves. *Journal of Dairy Science*, 97(12), 7804–7810.

- De Paula Vieira, A., M.A.G. von Keyserlingk, and D.M. Weary (2010). **Effects of pair versus single housing on performance and behavior of dairy calves before and after weaning from milk.** *Journal of Dairy Science* 93(7): 3079-3085.  
Online: <https://dx.doi.org/10.3168/jds.2009-2516>
- De Paula Vieira, A., D.M. Weary, and A.M. de Passillé (2012). **Effects of the early social environment on behavioral responses of dairy calves to novel events.** *Journal of Dairy Science* 95(9): 5149-5155.  
Online: <https://dx.doi.org/10.3168/jds.2011-5073>
- Duve, L.R. and M.B. Jensen (2012). **Social behavior of young dairy calves housed with limited or full social contact with a peer.** *Journal of Dairy Science* 95(10): 5936-5945.  
Online: <https://dx.doi.org/10.3168/jds.2011-5170>
- Duve, L.R., D.M. Weary, U. Halekoh, and M.B. Jensen (2012). **The effects of social contact and milk allowance on responses to handling, play, and social behavior in young dairy calves.** *Journal of Dairy Science* 95(11): 6571-6581.  
Online: <https://dx.doi.org/10.3168/jds.2011-5170>
- Ehrlenbruch, R., G.H.M. Jørgensen, I.L. Andersen, and K.E. Bøe (2010). **Provision of additional walls in the resting area-The effects on resting behaviour and social interactions in goats.** *Applied Animal Behaviour Science* 122(1): 35-40.  
Online: <https://dx.doi.org/10.1016/j.applanim.2009.11.004>
- Franz, H., E. Roitberg, B. Lührke, G. Nürnberg, G. Dietl, and R. Kinzelbach (2002). **Visual discrimination learning of group-housed goats at an automated learning device.** *Archiv Fur Tierzucht* 45(4): 387-401.
- Færevik, G. (2008). **Social dynamics in dairy calves in relation to housing conditions.** PhD Thesis, Norwegian University of Life Sciences, Department of Animal and Aquacultural Sciences, 120 pages.
- Færevik, G., K.E. Bøe, and M.B. Jensen (2006). **Dairy calves social preferences and the significance of a companion animal during separation from the group.** *Applied Animal Behaviour Science* 99(3-4): 205-221.  
Online: <https://dx.doi.org/10.1016/j.applanim.2005.10.012>
- Gaillard, C., R.K. Meagher, M.A. von Keyserlingk, and D.M. Weary (2014). **Social housing improves dairy calves' performance in two cognitive tests.** *Plos One* 9(2).  
Online: <https://dx.doi.org/10.1371/journal.pone.0090205>
- Guesdon, V; Meurisse, M; Chesneau, D; Picard, S; Levy, F; Chaillou, E (2015). **Behavioral and endocrine evaluation of the stressfulness of single-pen housing compared to group-housing and social isolation conditions.** *Physiology & behavior* 147: 63-70.  
Online: <https://dx.doi.org/10.1016/j.physbeh.2015.04.013>
- Hänninen, L., A.M. De Passillé, and J. Rushen (2005). **The effect of flooring type and social grouping**

**on the rest and growth of dairy calves.** *Applied Animal Behaviour Science* 91(3-4): 193-204.  
Online: <https://dx.doi.org/10.1016/j.applanim.2004.10.003>

Hepola, H., L. Hänninen, P. Pursiainen, V.M. Tuure, L. Syrjälä-Qvist, M. Pykkönen, and H. Saloniemi (2006). **Feed intake and oral behaviour of dairy calves housed individually or in groups in warm or cold buildings.** *Livestock Science* 105(1-3): 94-104.  
Online: <https://dx.doi.org/10.1016/j.livsci.2006.04.033>

Herskin, M.S., L. Munksgaard, and J.B. Andersen (2007). **Effects of social isolation and restraint on adrenocortical responses and hypoalgesia in loose-housed dairy cows.** *Journal of Animal Science* 85(1): 240-247.  
Online: <https://dx.doi.org/10.2527/jas.2005-346>

Jóhannesson, T. and J.T. Sørensen (2000). **Evaluation of welfare indicators for the social environment in cattle herds.** *Animal Welfare* 9(3): 297-316. ISSN: 09627286.

Jørgensen, G.H.M., I.L. Andersen, S. Berg, and K.E. Bøe (2009). **Feeding, resting and social behaviour in ewes housed in two different group sizes.** *Applied Animal Behaviour Science* 116(2-4): 198-203.  
Online: <https://dx.doi.org/10.1016/j.applanim.2008.08.014>

Jensen, MB; Herskin, MS; Thomsen, PT; Forkman, B; Houe, H (2015). **Preferences of lame cows for type of surface and level of social contact in hospital pens.** *Journal of dairy science* 98(7): 4552-4559.  
Online: <https://dx.doi.org/10.3168/jds.2014-9203>

Jensen, M.B., C.C. Krohn, L. Munksgaard, and K.S. Vestergaard (1997). **Effect of single versus group housing and space allowance on responses of calves during open-field tests.** *Applied Animal Behaviour Science* 54(2-3): 109-121.  
Online: [https://dx.doi.org/10.1016/S0168-1591\(96\)01183-5](https://dx.doi.org/10.1016/S0168-1591(96)01183-5)

Jensen, M.B., C.C. Krohn, and K.S. Vestergaard (1998). **Play behaviour in dairy calves kept in pens: The effect of social contact and space allowance.** *Applied Animal Behaviour Science* 56(2-4): 97-108.  
Online: [https://dx.doi.org/10.1016/S0168-1591\(97\)00106-8](https://dx.doi.org/10.1016/S0168-1591(97)00106-8)

Jensen, M.B. and L.E. Larsen (2014). **Effects of level of social contact on dairy calf behavior and health.** *Journal of Dairy Science* 97(8): 5035-5044.  
Online: <https://dx.doi.org/10.3168/jds.2013-7311>

Jensen, M.B., L. Munksgaard, L. Mogensen, and C.C. Krohn (1999). **Effects of housing in different social environments on open-field and social responses of female dairy calves.** *Acta Agriculturae Scandinavica - Section a: Animal Science* 49(2): 113-120.

Kerr, S.G.C. and D.G.M. Wood-Gush (1987). **The development of behaviour patterns and temperament in dairy heifers.** *Behavioural Processes* 15(1): 1-16.

Krohn, C.C. (1994). **Behaviour of dairy cows kept in extensive (loose housing/pasture) or intensive (tie stall) environments. III. Grooming, exploration and abnormal behaviour.** *Applied Animal Behaviour Science* 42(2): 73-86.

Meagher, R.K.; Daros, R.R.; Costa, J.H.; von Keyserlingk, M.A.; Hoetzel, M.J.; Weary, D.M. (2015). **Effects of degree and timing of social housing on reversal learning and response to novel objects in dairy calves.** *Plos one* 10(8). Article No.: e0132828.  
Online: <https://dx.doi.org/10.1371/journal.pone.0132828>

Menke, C., D.W. Fölsch, and S. Waiblinger (2000). **The importance of herd management in loose housing systems to the social behaviour of dairy cows.** *Deutsche Tierärztliche Wochenschrift* 107(7): 262-268.

Neisen, G., B. Wechsler, and L. Gygax (2009). **Effects of the introduction of single heifers or pairs of heifers into dairy-cow herds on the temporal and spatial associations of heifers and cows.** *Applied Animal Behaviour Science* 119(3-4): 127-136.  
Online: <https://dx.doi.org/10.1016/j.applanim.2009.04.006>

Nikkhah, A. and R. Kowsar (2012). **Seasonal and group effects on dairy cow behavior in large yards.** *Turkish Journal of Veterinary and Animal Sciences* 36(2): 123-129.  
Online: <https://dx.doi.org/10.3906/vet-1012-626>

Nordmann, E; Barth, K; Futschik, A; Palme, R; Waiblinger, S (2015). **Head partitions at the feed barrier affect behaviour of goats.** *Applied animal behaviour science* 167: 9-19.  
Online: <https://dx.doi.org/10.1016/j.applanim.2015.03.011>

Patt, A., L. Gygax, B. Wechsler, E. Hillmann, R. Palme, and N.M. Keil (2013). **Factors influencing the welfare of goats in small established groups during the separation and reintegration of individuals.** *Applied Animal Behaviour Science* 144(1/2): 63-72.  
Online: <https://dx.doi.org/10.1016/j.applanim.2012.11.009>

Pempek, J. A., Eastridge, M. L., Swartzwelder, S. S., Daniels, K. M., & Yohe, T. T. (2016). Housing system may affect behavior and growth performance of Jersey heifer calves. *Journal of Dairy Science*, 99(1), 569–578.

Raussi, S. (2005). **Group management of young dairy cattle in relation to animal behaviour and welfare.** *Agrifood Research Reports*(71).

Raussi, S. (2003). **Human-cattle interactions in group housing.** *Applied Animal Behaviour Science* 80(3): 245-262.  
Online: [https://dx.doi.org/10.1016/S0168-1591\(02\)00213-7](https://dx.doi.org/10.1016/S0168-1591(02)00213-7)

Raussi, S., J. Kaihilahti, A. Boissy, E. Delval, I. Veissier, and P. Pradel (2005). **Does repeated regrouping alter the social behaviour of heifers?** *Applied Animal Behaviour Science* 93(1-2): 1-12.  
Online: <https://dx.doi.org/10.1016/j.applanim.2004.12.001>

Rushen, J., A.M. de Passillé, M.C. Appleby, D.M. Weary, and P. Sandøe (2014 ). **Alone or together: a**

**risk assessment approach to group housing.** *Dilemmas in Animal Welfare*: 169-187.  
Online: <https://dx.doi.org/10.1079/9781780642161.0169>

Villeneuve, L., H. Méthot, D. Cinq-Mars, and R. Bergeron (2009). **Effect of individual or paired housing during post-weaning on feed intake, growth rate and behaviour of lambs.** *Small Ruminant Research* 85(2-3): 99-104.  
**Online:** <https://dx.doi.org/10.1016/j.smallrumres.2009.07.007>

Voegeli, S., J. Lutz, M. Wolf, B. Wechsler, and L. Gygax (2014). **Valence of physical stimuli, not housing conditions, affects behaviour and frontal cortical brain activity in sheep.** *Behavioural Brain Research* 267: 144-155.  
**Online:** <https://dx.doi.org/10.1016/j.bbr.2014.03.036>

Vogeli, S; Wolf, M; Wechsler, B; Gygax, L (2015). **Housing conditions influence cortical and behavioural reactions of sheep in response to videos showing social interactions of different valence.** *Behavioural brain research* 284: 69-76.  
Online: <https://dx.doi.org/10.1016/j.bbr.2015.02.007>

Walker, J.K.; Arney, D.R.; Waran, N.K.; Handel, I.G.; Phillips, C.J. (2015). **The effect of conspecific removal on behavioral and physiological responses of dairy cattle.** *Journal of dairy science* 98(12): 8610-8622.

Wierenga, H.K. (1990). **Social dominance in dairy cattle and the influences of housing and management.** *Applied Animal Behaviour Science* 27(3): 201-229.

Wormsbecher, L., Bergeron, R., Haley, D., de Passillé, A. M., Rushen, J., & Vasseur, E. (2017). A method of outdoor housing dairy calves in pairs using individual calf hutches. *Journal of Dairy Science*, 100(9), 7493–7506. <https://doi.org/10.3168/jds.2017-12559>